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PROGRAM BOOK

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International
School and Conference
on Network Science

NETSCI 2016

MAY 30 - JUNE 3, 2016

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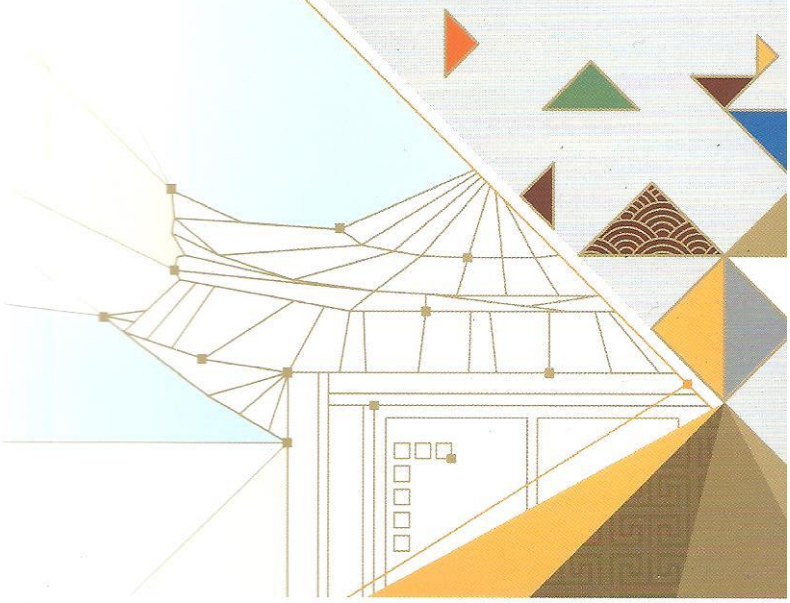

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[1]Institute for Computational Neuroscience, Korea, [2]Daegu Nat'l Univ. of Education, Korea

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[1]Shizuoka Univ., Japan, [2]Anan College, Japan, [3]Koichi College, Japan

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Jeehye Choi[1], Byungjoon Min[2], and K. -I. Goh[1]
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Effect of Network Architecture on Sparsely Synchronized Brain Rhythms in A Scale-Free Neural Network

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We consider a directed Barabási-Albert scale-free network model with symmetric preferential attachment with the same in- and out-degrees, and study emergence of sparsely synchronized rhythms for a fixed attachment degree in an inhibitory population of fast spiking Izhikevich interneurons. For a study on the fast sparsely synchronized rhythms, we fix J (synaptic inhibition strength) at a sufficiently large value, and investigate the population states by increasing D (noise intensity). For small D, full synchronization with the same population-rhythm frequency f_p and mean firing rate (MFR) f_i of individual neurons occurs, while for sufficiently large D partial synchronization with $f_p > \langle f_i \rangle$ ($\langle f_i \rangle$: ensemble-averaged MFR) appears due to intermittent discharge of individual neurons; particularly, the case of $f_p > 4\langle f_i \rangle$ is referred to as sparse synchronization. Only for the partial and sparse synchronization, MFRs and contributions of individual neuronal dynamics to population synchronization change depending on their degrees, unlike the case of full synchronization. Consequently, dynamics of individual neurons reveal the inhomogeneous network structure for the case of partial and sparse synchronization, which is in contrast to the case of statistically homogeneous random graphs and small-world networks. Finally, we investigate the effect of network architecture on sparse synchronization in the following three cases: (1) variation in the degree of symmetric attachment (2) asymmetric preferential attachment of new nodes with different in- and out-degrees (3) preferential attachment between pre-existing nodes (without addition of new nodes). In these three cases, both relation between network topology and sparse synchronization and contributions of individual dynamics to the sparse synchronization are discussed.